CACTUS AND SUCCULENT JOURNAL

Of the Cactus And Succulent Society Of America

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FIG. 1. *Conophytum Wettsteinii.* One of the 260 species native to So. Africa.

CACTUS AND SUCCULENT JOURNAL

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EDITOR'S NOTES

The questionnaire we enclosed with the JOURNAL expiration notices was not as clear as it might have been. Those who want to be listed in the Directory will not be excluded because they could not get the reply back before the time limit; the questionnaires were caught in the heavy Christmas mail and enough time was not allowed for their return. We had hoped to have all the renewals in so that we could give you a tabulation of the answers to the questions. The monographs mentioned are not available now but we were curious to know if there was sufficient interest to warrant their publication. Thus far we see that there must be a great many more serious students of cacti and succulents bofore scientific books can be published. We will have a complete tabulation in the March issue.

PRICKLY PEARS IN WEST INDIES

A resident of St. Johns, in Antigua of the Leeward Islands, recollected that 70 years ago "Prickly Pears" were used for inflamation of the bowels. The branches or "pads" were split and the large flat surface applied to the affected area. In those days the boys, in these islands, used lemons and limes for baseballs!

FROM TUCSON, ARIZONA

Mrs. Frank Seinsheimer says, "Am in the cactus land but due to lack of rain the desert looks worse than I have ever seen it. I have been here four months of every year since 1939 except 1941 when I went to Guatamala. Today (Dec. 20) it is snowing!

"MOTORING TO MEXICO"

This interesting and valuable booklet is available from the Travel Division, Pan American Union, Washington 6, D.C. The maps showing elevations will be of special interest to cactus growers. Send 25c in coin for a copy.

SEDUMS IN ITHACA, NEW YORK, AREA

"Checklist of the Vascular Plants of the Cayuga Quadrangle" by Robert T. Clausen is the title of Memoir 291, Cornell University Agricultural Experiment Station, September 1949. This interesting list includes the following Sedums: *S. Rosea* (L.) Scop.; *S. triphyllum* (Haw.) S. F. Gray; *S. spurium* M. B.; *S. sarmentosum* Bunge, *S. acre* L.; *S. ternatum* Michx.

ATTENTION CARTOONISTS

We plan a series of cartoons of terms used by cactophiles. Here is your first assignment: Echinopsis with pups. What does this bring to your mind? The best drawing will appear in the next JOURNAL.

LOSS OF TWO CHARTER MEMBERS

Society members will regret the decease of two well known members: Colonel Jordan of Los Angeles and Frank McCoy of Santa Maria.

ARTICLES WANTED

It has been suggested that the following subject would be most helpful for beginners. "How Shall I Start a Collection." One article would feature an outdoor year round garden in the mild climates and another for summer gardens in less favorable sections of the country. Another would discuss the window and indoor collections and the third, a collection for the glass or lath-house. Each article should include a dozen or two recommended plants with their common names, growing and flowering seasons, and culture. Just ask yourself, "How do I go about starting a collection?" and include minute details. Amateurs may be able to give better advice than experienced growers since the trials and successes are clearer in their minds than for those who have "the feel" for succulents. Here is a challenge Gerald Barad, Miss Nipper, A. C. Stadelman, Mrs. Montgomery, etc. Will you take part in this series? It could be one of the most valuable series of discussions for 1950.

VOLUNTEER TYPIST

Would one of our members care to contribute his time in transcribing the edited translation of "Notes on Argentine Cacti?" The translation of Carlos Hosseus' book was made some years ago by W. J. Holliday. Mr. Edgar Baxter has just completed editing the 100 pages of manuscript and now it has to be retyped before we can turn it over to the printer. Here is a worthwhile contribution to cactus study.

Next 32 page JOURNAL will be mailed March 20

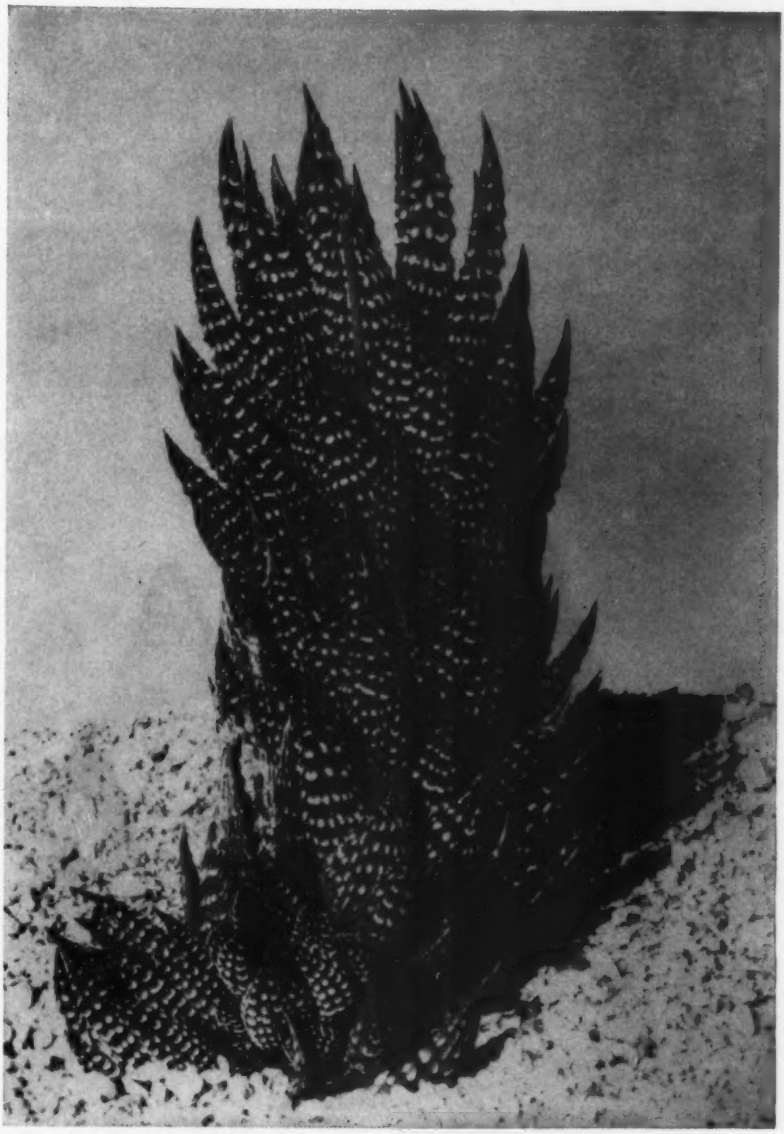

FIG. 2. *Haworthia Reinwardtii* var. *Archibaldiae* Poelln. nat. size.

NOTES ON HAWORTHIAS

By J. R. BROWN

Haworthia Reinwardtii Haw. var. **Archibaldiae** Poelln. in Repert. Sp. Nov. XLI (1937) 210, in Cact. Journ. VI (1937) 36, in Beitr. Sukk. Kunde (1940) 42, photo. Resende & Pinto-Lopes in Port. Acta Biol. II (1946) 187.

Plant with erect leafy stems to 15 cm. in length, 5-6 cm. in diameter, proliferous from the base.

Leaves about 4 cm. long, to 15 mm. broad towards the base, deep green, ovate-lanceolate, acuminate, and terminating in a short pellucid

point, which soon becomes brownish; face of leaves, in upper part, with numerous whitish tubercles in more or less lengthwise rows, back with very prominent, usually solitary, white tubercles about 1 mm. in diameter, occasionally to 1.5 mm. and arranged in 10-12 lengthwise rows and in more or less transverse rows.

Type locality: Cape Colony: Peddie, East London Road.

Named in honor of Mrs. Archibald.

A handsome, strongly marked form of *Haw. Reinwardtii*. This seems to be a rather slow growing form and is of comparatively low stature.

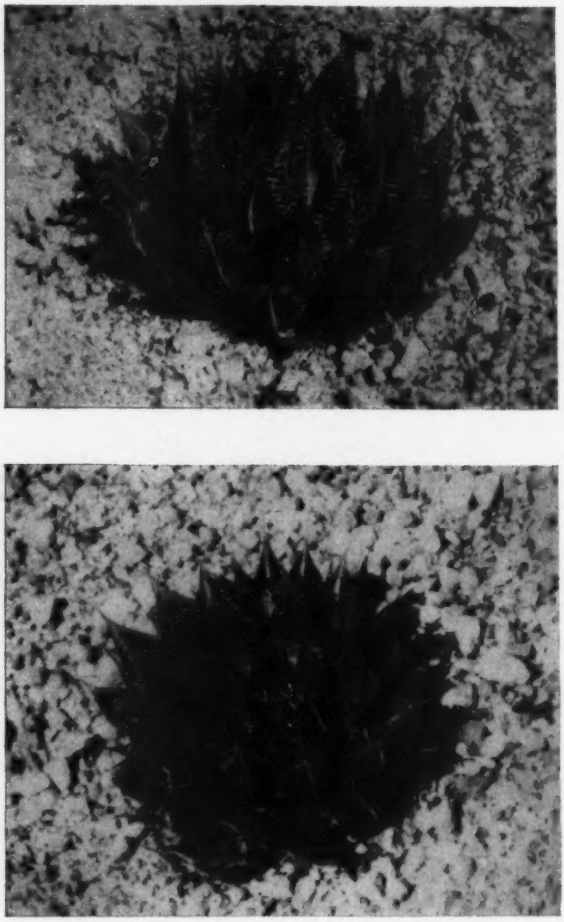

FIG. 3. *Haworthia Blackbeardeana* Poelln. nat. size.

Haworthia Blackbeardeana Poelln. in Repert. Sp. Nov. XXXI (1932) 82, XLIV (1938) 236, in Desert Plt. Life IX (1937) 90, photo.

Plant acaulescent, simple, many leaved, 5-6 cm. in diam.

Leaves more or less erect, the younger incurving in the upper part, ovate-lanceolate, acuminate, 2.5-3 cm. long, 8-10 mm. broad, about 5 mm. thick in the upper part, pale green, pellucid in the upper third, the pellucid area with several lengthwise green lines (about 4-6 longer and 4 shorter) which scarcely reach the apex; face of leaf somewhat convex towards the tip, flattish below; back of leaf rounded and with more numerous lines, 2 or 3 reaching the apex, more or less obliquely keeled in the upper part, occasionally with 2 keels; the upper

margins and the keels with white, ciliate teeth to 2 mm. in length, minutely serrate on the lower margins; the white, terminal bristle 5-10 mm. long, minutely ciliate on the lower part.

Peduncle simple, about 2 mm. diam., 20 cm. or more in length including raceme; sterile bracts numerous, ovate, long acuminate, to 6 mm. long; pedicels about 4 mm. long, bracts about the same; perianth 14 mm. long, tube obclavate, somewhat triangularly rounded, lightly curved, white with green lines, segments obtuse, recurving, white with green lines.

Type locality: Cape Province, Bowes Farm, 10 miles from Queenstown.

Also recorded from other localities in the vicinity of Queenstown and Grahamstown.

At first glance this little Haworthia would seem to belong to the sect. *Setato-Araneae* because of the numerous, long ciliate teeth on the leaf margins and keels, however, it is abruptly pellucid in upper part of the leaves and belongs in the sect. *Limpidae*.

Some variation is shown by plants of this sp. and two plants are shown in the illustration of this Haworthia. The upper plant agrees very well with Dr. von Poellnitz's description, while the plant in the lower photo has shorter teeth on the leaf margins and keels and shorter terminal bristles.

Greetings 1950

from

Mr. and Mrs. Fernando Schmoll

"To express our good will to our many friends in the cactus world we are contributing this printing plate not only because it is a most interesting crest but in memory of our friend and partner, the late Dr. Iwersen, who took the photograph."

FIG. 4. Crested plant of *Lemaireocereus stellatus* in the Tehuacan region of the State of Puebla.

EDITOR'S NOTES

BLATTER FUR SUKKULENTENKUNDE

We have just learned that Curt Backeberg does not know if another issue of his "Addenda to B. F. K." will be published. We understood and advertised that there would be two issues a year, but Mr. Backeberg says in a recent letter, "Editions were planned as occasion demanded. The price ($2 per year) was for Number 1 only. It is high and without profit on account of the small edition and the high costs." From now on the JOURNAL will not accept subscriptions for new publications until they have proven themselves for at least a year.

FIG. 5

GROWING EPIPHYLLUMS

All you have to do to grow Epihpyllums successfully is to import a colony of South American ants and hope that they build a "flower ball" as shown in the sketch. In the jungle trees the ants construct a mud ball in which they deposit seeds. These seeds sprout and the root system binds the ball together to prevent washing away. The greenery develops and bursts into flower thus providing a garden home safe from the floods below. The drawing herewith is by James Hido from a naturalistic wax display in the Chicago Natural History Museum.

RECOMMENDATION FOR NEXT BOTANICAL CONGRESS

The Journal of South African Botany recently commented on Rec. XLIII of the 1935 Rules of Botanical Nomenclature in which there was a recommendation that specific epithets be written with a small letter except where they are taken from the name of a person or are generic or vernacular names.

"There is a movement much favored in America and recently supported by Kew, that all specific epithets have small initial letters. This would certainly be simple. We have all got used to small letters for geographic epithets and could probably soon become accustomed to such things as *Gladiolus bolusii,* etc. On the other hand the dropping of the initial capital epithets which are generic names or are vernacular names may often obscure historical data and may result in apparent bad grammar. For example *Schinus molle* written so are hardly a credit to botanical scholarship."

The editor of the Cactus and Succulent JOURNAL of America has advocated the use of small letters for the last 20 years and authorities as R. S. Woods, the late Dr. R. W. Poindexter, Dr. Robert T. Craig, as well as Drs. Britton and Rose have all advocated a uniform system such as has been found practical in the other sciences. We hope that the 1950 Conference will be sufficiently progressive to give this matter due consideration.

BLUHENDE KAKTEEN REPRINT

We are continuing the reprinting of the plates from the rare German publication "Blühende Kakteen." Readers should enjoy each section in itself rather than being impatient until its completion. It is interesting to see the plants that attracted attention of cactus collecors in 1900—or fifty years ago. We are indebted to Mr. Myron Kimnach of Palo Alto for the fine translation; we have never had the pleasure of working with such clean manuscript. Our own President Emeritus, Wm. Taylor Marshall, is responsible for the notes on present day classification of the plants mentioned.

NEW OFFICERS FOR 1950

At the meeting of the Executive Board of the Cactus and Succulent Society of America, Inc., held December 16th, 1949, the ballots were counted and the following results were determined. Those elected are as follows:

President, Dr. Robert Craig.
Vice-President, Homer G. Rush.
Secretary, Ethel Rush.
Treasurer, George G. Glade.
For the Board, four year term:
John Akers, George Lindsey, Phyllis Dow.

ETHEL RUSH, *Secretary.*

THE CACTUS AND OTHER SUCCULENT LEAGUE
OAKLAND, CALIFORNIA
DEC. 6, 1949

As President of this Club I would like to issue an invitation to any member to visit with us when in the vicinity. We meet on the first Sunday of each month, usually, but not always at the same place so it would be wise to contact me by letter or phone (LAkehurst 2-0731). I may be able to arrange a tour of the various member's gardens if suitable time is allowed. I am glad to report that our membership is increasing at every meeting and hope the trend continues. A very enjoyable Christmas party was held last Sunday with 56 members present. Succulent collections seem to predominate in this area, probably because they do so well, however we have a few good Cactus collections in the vicinity.

A. E. IRVING
2163 Alameda Ave., Alameda, Calif.

BRITTON AND ROSE CACTACEAE REPRINT

Sets of this monograph are still available. Write to Book Mark, 3536 North Stone Ave., Tucson, Arizona.

ARIZONA CACTI

No. 7 of a series by R. C. PROCTOR, Phoenix, Arizona.

FIG. 6. *Echinomastus intertextus* photographed south-east of Benson, Arizona. This plant was about 4 inches high; flowers have pink petals or lavender along the mid-ribs the margins white.

WATER BALANCE IN SOILS

By Dr. Louis E. Blanchard

Water, the vital fluid of life, comprises about 90 per cent of the bulk of living plant tissues. It is not only an essential nutrient compound, but also enters chemically into the manufacture of foods. It acts as a general solvent; it is the medium for the plant's transpiratory and other physiological processes; it represents the liquid phase of the tissue colloidal systems; it is essential in photosynthesis. Humid region plants require ample moisture to maintain tissue turgidity and to replace the water lost through transpiration. Of the many factors involved in growth, the adequate supply of available soil-moisture is of prime importance. Where rainfall is heavy, as in certain tropical regions, rank vegetation prevails. In the desert, with low rainfall, vegetation is scant and only such plants as cacti and other *xerophytes* that have developed a special capacity for the accumulation and retention of water, have been rewarded with existence in a rugged environment.

The source of moisture to plants is from the soil-water, and the available amount will depend upon the physical behaviors involved in the adjustment, retention and motion of this water.

When a small-bore glass tube (capillary tube), is placed in water, the liquid within the tube will rise against gravity to a point higher than its outside level. Inasmuch as the adhesion between water molecules and glass is greater than the cohesion between the water molecules, the fluid will moisten the glass and move upward, producing a curved effect at the liquid surface, known as a meniscus. The smaller the bore, the higher will be the rise as most of the water will be held by a strong adhesive force, and the cohesive force will therefore be able to support a tall column of water. In a large tube, a relatively small amount of water is held by adhesion, and cohesion will only support a short column. The elevation of the water-column for any tube increases as the diameter of its bore decreases, and this relation is known as an inverse proportion.

All liquid surfaces are under an elastic tension because of unbalanced cohesive forces. Molecules of water below the surface, are pulled equally in all directions by surrounding molecules and are therefore at equilibrium. At the surface, these forces act laterally and downward but not upward. This imbalance with its resultant downward force, so compresses the upper layer of water molecules, that it acts like an elastic membrane and is known as surface tension. Insects such as water spiders, move freely on this film. A clean steel needle, if laid carefully on water, will float. A rain drop is spherical because the contractile forces of surface tension compress it into the smallest possible volume. A bursting soap bubble breaks inwardly and illustrates the contracting nature of a film. Surface tension varies with the curvature of the film and is greater in a small capillary tube than in a larger one. A small drop of water has a greater film curvature than a large one, and is under greater surface tension. This force is inversely proportional to the radius of the curvature. A small capillary tube with half the radius of a larger one, will have twice the pulling power.

Any material that has a large amount of surface surrounding small communicating tubes and spaces, such as blotters and wicks, will possess good capillarity. The soil is such a structure with an intricate maze of tortuous pores and spaces in which the dynamic properties of water are similar to those described in capillary tubes.

When water is applied to a soil, whether by rain or artificial methods, there is a retention due to energy factors involved. The retentive forces that hold soil-water against the pull of gravity are adhesion, or the mutual attraction between soil and water; and cohesion, or the attraction of water molecules for each other. This force of retention is expressed in terms of centimeters of height of a unit column of water that produces a tension of equal magnitude. Inasmuch as greater centimeter heights indicate greater force, we may express this force in gravity units.

Certain forms of water, such as is held by colloidal adsorption, are retained with such enormous force that it would require for their removal, a force equivalent to the weight of a column of water over a million centimeters in height. To avoid the use of such cumbersome figures, these energy values are expressed in terms of their logarithms or as pF values. The symbol p indicates a logarithmic value and F implies energy. A pF of 2 has the force equivalent to the weight of a column of water 100 centimeters (10 x 10) in height. 1000 centimeters (10 x 10 x 10) would correspond to a pF of 3 and so on. The maximum force of water retained would be about 10,000,000 centimeters, or a pF of 7. The method of calculation is similar to that employed in interpreting the pH of soil reactions.

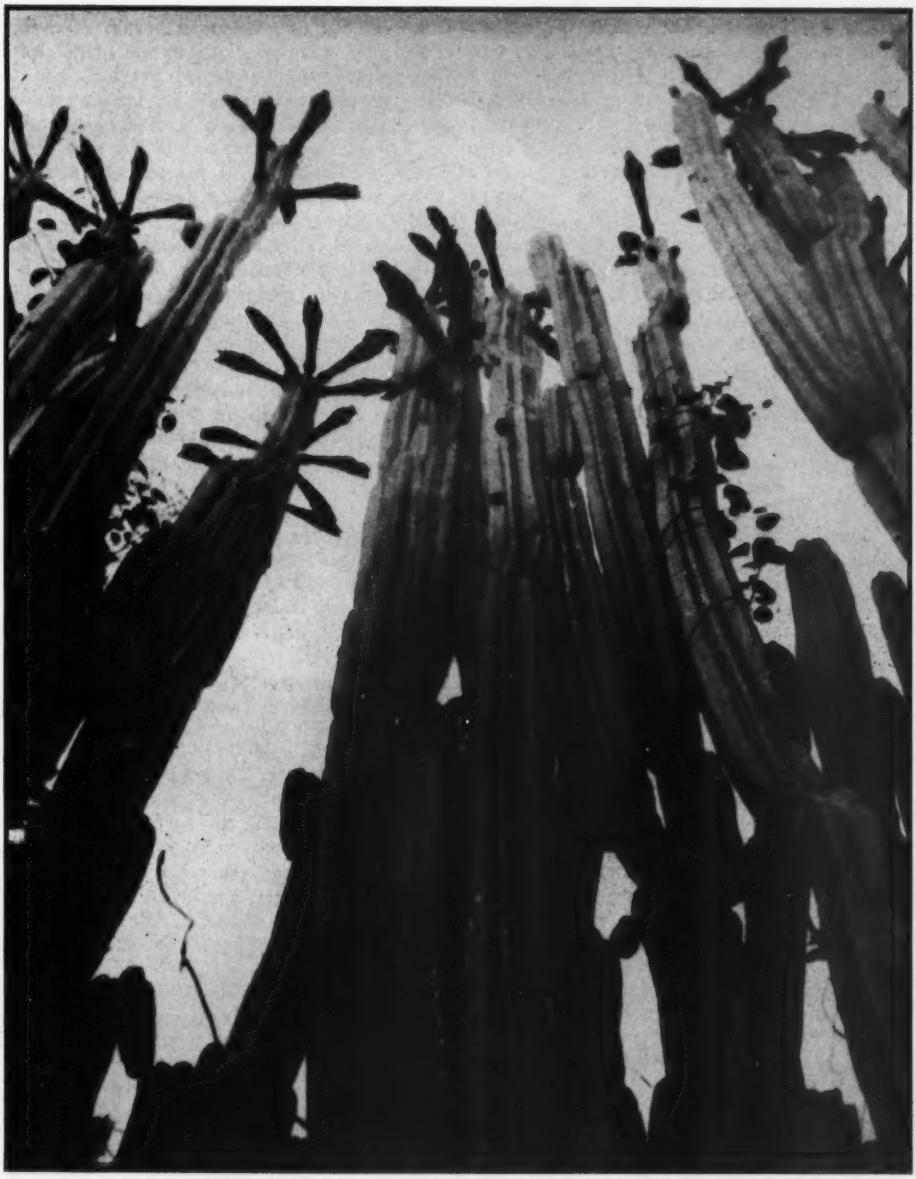

FIG. 7. It is a thrill to look up into the towering branches of this *Trichocereus pachanoi* when one realizes that they consist of about 90° water. Photographed in northern Peru by Curt Backeberg.

When soil is saturated with water and allowed to drain, the amount of moisture retained is designated as *field capacity*. It has been shown experimentally that the amount of water held in a column of soil at field capacity, has an average film tension of about ½ atmosphere (pF 2.7). At the base of the column, the water is held at a pF of Zero. Water that is held at momentary equilibrium in a soil that is not connected with a water table, has a negative pressure of about ½ atmosphere at all fronts.

The removal of water by gravity, is called drainage or *gravitational water* and this occurs at a pF of 2.7 and below. A pF of 2.7 is equivalent to a unit column of water about 500 centimeters in height or approximately ½ at-

mosphere of pressure. The weight of air at sea level or atmospheric pressure, equals 14.7 lbs. per square inch.

Moisture retained by soil within certain energy ranges are classified as *hygroscopic, capillary* and *gravitational*. Air-dry soils have small amounts of water held by adhesion. The percentage of such adsorbed moisture is designated as the *hygroscopic coefficient* and varies with the colloidal content of the soil and the humidity of the air. Hygroscopic water represents a very thin film tenaceously held at about 10,000 atmospheres of pressure (pF of 7) and is therefore immovable, unavailable and has no biological significance. The hygroscopic coefficient shows marked variations according to soil types. Where the organic content is low, as in a sandy loam, it may be only 1 or 2 per cent by weight. In a heavier soil with 5 per cent organic matter, it may be as high as 15 per cent; in peaty soils, it may reach 70 per cent. It is obvious that high organic soils may contain large amounts of water in an inactive or unavailable form. Recently in our shaded greenhouse, bench grown Impatiens plants wilted in a peaty soil mixture that was palpably moist. However, the application of more water corrected this condition. Because of the high hygroscopic coefficient of peat, this particular affinity for water at high tension levels must first be satisfied, before any moisture at low tension levels will be available for plant consumption. It is apparent, that in comparing soil moistures, the percentages may be misleading, as only the increment of water at low capillary tension is of biological importance. Soils high in organic matter have an increased total water-holding capacity and do not dry easily, but must be kept wetter for ample available moisture. The capillary tension, rather than the percentage of water is of prime importance. With light watering or rainfall, a mulch of peat may actually reduce the water intake by absorbing the moisture and losing it to evaporation.

Gravitational water is transient and soon lost. It rapidly passes downward to a level where all pore spaces are filled with standing or *hydrostatic water*. With good drainage, such a condition in the upper soil layers would only be temporary, with no adverse biochemical changes. Where drainage is inadequate, the air is excluded and toxic products that cannot be oxidized accumulate. In such a medium, the pathogenic anerobic bacteria flourish and normal biological and chemical activities are impossible. Such anerobic putrefaction is associated with offensive odors in waterlogged soils. By the reduction of sulphates to sulphides, and nitrates to nitrites, toxic compounds are also produced. Root suffocation under such conditions adds another link to a pathological chain of events, that makes the normal absorption of nutrients, impossible. In greenhouse benches, gravitational water is useful for its leaching effects when soluble salts become excessive, particularly after steam sterilization. Under such conditions, the liberal use of percolating water as a solvent to remove excess salts and toxic products, if present, is advisable.

Capillary water is coincident with the soil-solution that remains after drainage. It furnishes plants with most of their fluids; its energy relations are within physiological limits; it is a solvent for plant nutrients; it remains long enough to be biologically useful. The capillary movement and adjustment of soil solutions and their relationship to plant physiology are of vital importance. Capillarity accounts for soil water movements other than the downward movement due to gravity.

Soil structure presents an intricate labyrinth of heterogenous pores and spaces with ramifying tortuous communicating channels which produce a capillary system. When the soil particles are fine, a large area will be exposed in proportion to the spaces between them and the higher will the water rise. Small particles of soil are readily surrounded by a capillary film of water, but when the soil spaces are large, as when the soil is tilled, the film cannot surround coarse particles and there is a capillary break and loss of water by surface evaporation is greatly reduced.

Evaporation at the soil surface, attraction by dry soils and absorption of water by root hairs, thin the water films and increase their curvatures. This increases the negative pressure and water moves upward through the soil capillary system until the weight of the water lifted and the surface tension are at equilibrium. The height to which capillarity is effective varies with the composition and physical structure of the soil, and on the average will be only several feet.

Humus is produced by microbial decomposition of organic matter. It is not only an indispensable constituent because of its biochemical influences but is also a prime factor in improving soil structure. Because of its fragmentary character, it encourages granulation with crumbly soil formation, and by greatly increasing the soil porosity, adds to its capillary activity and water-holding ability. It also greatly increases the *ionic exchange* capacity, so vital in plant nutrition. In its microbial decay, it promotes hormone production as well as the formation of antibiotics, such as penicillin, aureomycin, streptomycin, etc. These potent antibacterial products represent the most recent medical advancement in the treatement of cer-

tain types of infection and is also employed in the active and therapeutic treatment of conditions that previously had no effective chemotherapeutic agent. By the absorption of these germicidal substances, it is probable that plants develope a resistance or even an immunity against certain diseases. Good soil management should provide a continuous supply of organic matter, as many vital and physical factors as well as productivity, are controlled by its presence.

In heavy soils, the capillary system is finer and of good continuity, but water movement is sluggish in small channels, the adjustment is slow, and the amount delivered, is inadequate for optimum plant growth. In sandy soils, the capillary adjustment is rapid, but the presence of entrapped air and large pores cause so many capillary breaks, that the rise of moisture is limited. For optimum growth, an efficient capillary system must deliver a rapid flow of water in adequate volume. When capillary water is low, it is held at high energy levels and becomes unavailable.

Cacti and other plants that are adapted to desert conditions, will grow in a sluggish capillary water supply and are able to extract moisture held in the soil at high energy levels. As soil moisture is reduced by evaporation and plant activity, the remaining fluid is held with increasing tenacity. Humid region plants with high transpiratory losses of water, wilt and soon die under such conditions. Desert plants, by their ability to reduce transpiratory losses to a very low degree, compensate satisfactorily to this diminished water supply. MacDougal and Spalding have shown that the osmotic activity in the sap of succulents ranges from 5 to 12 atmospheres and that this pressure is doubled when their water-balance is depleted. High osmotic activity enables these plants to use soil water that is held close to the hygroscopic coefficient.

Some soils, though flooded, may still present a dearth of available water. Such conditions are present in salt marshes where the water contains large amounts of dissolved salts. From a physiological point of view, this simulates arid conditions, and only certain plants known as *halophytes,* that have adapted themselves in a manner similar to *xerophytes,* can survive. The Mangrove Family of shrubs (Rhizophoraceae) have well adjusted themselves to saline and brackish habitats. These shrubs propped on many arching roots to protect themselves from high tides, are abundant in the coastal marshes in central and southern Florida. The dense evergreen growth of these mangrove shrubs (Rhizophora Mangle) with their leathery foliage, give the marshes a picturesque jungle appearance.

Soils that have been heat sterilized lose considerably in their water-holding capacity. In freshly steam sterilized soils in greenhouse benches, water will percolate as freely as in gravel. Some observers believe this condition is brought about by the coagulation of colloidal soil particles. Changing a fine texture soil into coarse particles with large pores, greatly reduces the capillary area and dimishes the water-holding capacity. This is only a temporary condition. Leaching to remove excess soluble salts and toxic products after sterilization, helps to correct this condition. In several weeks, the soil usually regains its normal capillary activity. During this period, more frequent watering is necessary than in non-sterilized soils.

The amount of water conducted in a soil by capillarity in a unit of time is of prime significance. Providing the physical structure is optimum for this conductance, the volume of capillary flow between two unit distances will depend on the difference in tension. The greater this *tension gradient,* the more rapid is the flow. In other words, the moisture adjustment between a wet and a dry soil will be rapid, but the adjustments between soils of low moisture content, will be sluggish. Water conductance is encouraged through a film of moisture in a damp soil. A very dry soil may stubbornly resist wetting because of entrapped air in large pore spaces.

Some greenhouse growers now use the constant water level benches to obtain maximum capillarity. Watertight shallow "V"-shaped benches are leveled with about one inch of gravel and a conductor channel placed in the "V." Soil of good physical quality is added to fill the bench. By the use of a reservoir and a float valve, the water is kept at a constant level in the gravel. With a constant water table in proximity to the soil, there exists not only a high tension gradient for rapid delivery of water by capillarity, but the continuous supply keeps this moisture in low energy levels where it is easily available to plants. Under no condition, should the water level be in the soil as detrimental anerobic bacterial activity will result. Adjustments of water levels for optimum moisture should always be in the gravel zone. In our experience, vigorous growth of plants is produced in constant automatic water level benches. When soil tests indicate the need of fertilizers, these benches may be drained and no water applied for several days. A dilute liquid fertilizer may then be added to the surface by the hose and syphon method. This will not only furnish the nutrient requirements but will also wash down any excess soluble salts that may have accumulated at the soil surface.

There are several other approved methods of automatic watering, such as injection for bench crops, perforated surface tubes, wicks and various types of sprinklers. Much credit is due to Professor Post (Cornell) for the development of these systems. All these methods involve capillary conduction and maintain uniform moisture at low tension levels.

We use the Burnham-Lark soil tensiometers in our greenhouses. A porous porcelain cup and a vacuum gauge are connected with a tube. When the system is filled with water, and the porous cup is inserted in the soil, the vacuum gauge indicates the tension of the soil water. Each graduation (1 to 100) represents one hundredth (1/100) of an atmosphere of pressure, or 10 centimeters of water. Three of these capillary potential divisions corresponds to about one inch of mercury. In wet soils the pore spaces are filled and the tension of the soil water is at atmospheric pressure and the gauge reading approaches a capillary potential of zero. As the soil dries, the increasing capillary tension produces a partial vacuum tension when the water is pulled out from the porcelain pores.

In our experience, the most vigorous growth is in the constant water level benches, when the soil tensiometer is at zero potential at the root region. At such favorably low tension, the roots absorb water with very little effort and wilting of plants never occurs even in the hottest summer days. With such adequate water delivery, no shading is necessary for many types of crops. In benches where surface water is applied by the hose method, we allow the tension to just start rising before watering again, as plants grow better when the soil is near its maximum capillary capacity.

Success with fertility is intimately associated with adequate water management, as available nutrients must be in solution to be of any value to plants. The acid reaction of soil-water due to the presence of carbon dioxide excreted by plant roots during respiration, and by the activities of soil bacteria and fungi, enhances its solvent power. Thus, soil-water in the form of dilute carbonic acid, will not only readily absorb all soluble material in the soil, but will act on insoluble particles to produce soluble salts.

Automatic types of watering have many advantages. They are labor-saving devices and deliver adequate water when the plants need it and there is no set-back from delayed or inadequate watering. Soil sanitation is good with uniform moisture. Porosity for air and capillarity are easily maintained, as there is no compaction of the soil by surface watering. Foliage can be kept dry.

Regardless of the type of watering and whether in greenhouses or outside, the application should be of sufficient penetration to moisten the soil around the roots. Small amounts of water gravitate a short distance before coming to an equilibrium. Losses by evaporation and root absorption, produce an adjustment to higher soil levels with an ever increasing tension of the remaining water. The deeper roots cannot grow or absorb moisture that is trapped by high energy forces. Frequent light watering is undesirable. Root tips are sensitive to soil-water variations and will grow in the direction of increased moisture. This response known as *hydrotropism,* produces an abundant root growth near the surface where root damage will quickly take place under dry conditions. When water is applied less often but freely, the roots will grow downward and deeper toward regions of greater moisture as it follows the descending *water-table.*

The roots of certain cacti (Echinocacti), while very extensive, grow close to the surface in desert regions. This enables these plants to capture the moisture of condensation from the air and frequently this is the only available water for long periods. Under certain conditions, soil *water-vapor* may supply available moisture. Water in a desert soil below the zone of capillary activity, will produce water-vapor. This vapor is under pressure which increases with the temperature. The sudden temperature drop that often occurs in deserts at night, will cool the surface areas rapidly. The water-vapor in the soil-atmosphere, rising from a deep warm zone to a cool surface area, will furnish additional moisture on condensation.

An understanding of the dynamic properties of water as a soil constituent and its behavior at various energy levels, are helpful in interpreting the plant responses to our water and soil management.

SUMMARY

Water is an essential nutrient and general solvent. It is retained in the soil under varying dynamic forces in a complex capillary network. Certain portions of moisture are so tenaceously held that they have no biological significance; other portions under moderately high tension can only be used by desert plants through special adaptations. Peaty soils require an unusual amount of water as considerable moisture locked by high tension is unavailable to plants. Humid region plants attain optimum growth when ample water at low tension is continuously available. A favorable soil water-balance is only possible when soil structure is made porous with organic material. Humus is a dynamic indispensable soil constituent and should be continuously supplied as it is the controlling agent in the biochemical, physical and productive factors in good soil management.

STUDIES IN ARIZONA CACTACEAE

By R. H. PEEBLES, Sacaton, Arizona

From *Leaflets of Western Botany*, Vol. 5, No. 12, December 5, 1949

1. TWO NOVELTIES IN THE GENUS SCLEROCACTUS

Sclerocactus intermedius Peebles, spec. nov.

Stem ovoid-cylindric, up to 2 dm. high; ribs low, about 13, slightly spiralled; central spines 4, forming a cross, 3-5 cm. long, the upper one whitish, flattened, 1.15-2 mm. wide at base, slightly ribbed lengthwise on upper surface, erect, sometimes twisted, not hooked; other central spines reddish, more or less quadrangular, less than 1.5 mm. wide at base, spreading, often hooked; radial spines about 12, white, shorter than the centrals, straight or slightly twisted, never hooked; flowers purple, 4-5 cm. high; inner perianth-segments 2-2.5 cm. long, obovate-oblanceolate, obtuse, short-acuminate by extension of the midvein; style 2.5 mm. thick, puberulent; stigma lobes 9.

Type specimen: *Peebles & Parker No. 14712*, 9 miles southwest of Pipe Springs, Mohave County, Arizona, altitude 5000 feet, May 8, 1940, deposited in the herbarium of the California Academy of Sciences, No. 351112. A photograph of the type plant is shown in Benson et al., Univ. Ariz. Biol, Sci. Bull. No. 4, Pl. XLV, as *Echinocactus Whipplei*. The only other collection of *S. intermedius* known to the author is *Peebles & Smith No. SF 1059*, Sweetwater, Apache County, Arizona, altitude 5650 feet, June 10, 1937, preserved in the herbarium of the U. S. Field Station, Sacaton, Ariz.

This species is intermediate between *S. Whipplei* (Engelm. & Bigel.) Brit. & Rose and *S. polyancistrus* (Engelm. & Bigel.) Brit. & Rose. The plant body and spines are similar to the latter species but the flowers are smaller and the style is puberulent as in *S. Whipplei*.

Sclerocactus Whipplei (Engelm. & Bigel.) Brit. & Rose var. *pygmaeus* Peebles, var. nov.

Stem globose, 5 cm. high, sparsely armed; central spines dark brown, less than 2 cm. long, sometimes hooked; lower areoles with centrals short and few and radial spines puberulent; flowers not known; berry globose, 7 mm. high; seeds black, tuberculate, the hilum small.

Type specimen: *Peebles & Smith No. SF 1054*, 15 miles north of Ganado, Apache County, Arizona, altitude 6200 feet, June 10, 1937, deposited in the herbarium of the California Academy of Sciences, No. 351111.

Puberulent spines are a characteristic of juvenile specimens of *S. Whipplei*. It is possible that var. *pygmaeus* is what may be termed an adolescent form of that species, but a series of specimens ranging from young seedlings to fully developed typical forms such as the one collected by C. J. King at Ganado in 1938 (Sacaton Herbarium) is required to settle the question.

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2. THREE NEW COMBINATIONS IN CACTACEAE

Echinocereus Boyce-Thompsoni Orcutt var. *Bonkerae* (Thornber & Bonker) Peebles, comb. nov. *Echinocereus Bonkerae* Thornber & Bonker, The Fantastic Clan 71, 72 (1932).

Wilcoxia Diguetii (Weber) Peebles, comb. nov. *Cereus Diguetii* Weber, Paris Mus. Hist. Nat. Bull. 1:319 (1895). *Neoevansia Diguetii* Marshall ex Marshall & Bock, Cactaceae 84 (1941).

Opuntia Kunzei Rose var. *Wrightiana* (Baxter) Peebles, comb. nov. *Grusonia Wrightiana* Baxter, California Cactus 58 (1935). *Opuntia Wrightiana* Peebles, Desert Plant Life 9:43 (1937). *Opuntia Stanlyi* var. *Wrightiana* L. Benson, Proc. Calif. Acad. Sci. ser. 4, 25:248 (1944).

CACTI IN BOLIVIA

In Vol. VI, Number 5, 1949, of "Revista de Agricultura," Dr. Martin Cardenas publishes new localities of cacti in Bolivia. The first part of the article deals with the unknown locality of *Lobivia caespitosa* (J. A. Purpus) Br. & R. in Bolivia which is the Cordillera of Tunari from the top of the highway Cochabamba-Morochata to the Hacienda El Choro at an average altitude of 3200 m. A new description of the species was made from living plants in their habitat. The second part of the paper reports the extended range of several additional cacti. The occurrence of the following cacti in Bolivia has not been previously reported: *Cleistocactus baumanni* Lem. reported from Argentina, Paraguay and Uruguay. *Harrisia tortuosa* (Forbes) Br. & R. from Argentina. *Stetsonia coryne* (Salm-Dyck) Br. & R. from Argentina. The first species has been found near Camiri; the second between Carandati and Boyube; and the third, around Boyube—all in Bolivia.

KEEPING UP WITH THE SPINES
G. L. Berry
and
Other Cactophiles

No matter how rare the plant is and how much you want it, don't buy an infected plant unless you are willing to put it in quarantine for a long time in a place where you can watch it and where it cannot rub elbows with your clean plants.

—o—

I thought I was a true cactophile but, if determination is any indication, Miss Emily S. Steele of Washington, D.C., is tops. She grows them in a window on top of three bookcases in the office where she works and where they get only three hours of sunshine a day in the wintertime. But she likes them for she is buying books on cacti in order to keep up to date and says that she plans on making them her hobby when she retires.

—o—

Mrs. Alice Dykes, way up in Milwaukee, Oregon, thinks her plants are mixed up on their dates. "I think our summer-like weather in Oregon has really upset things as far as cacti are concerned," she writes, "I have two Epiphyllums, *Padre* and *Vive Rouge* coming into bloom. Padre has twenty buds and Vive Rouge has one with signs of many more. They both bloomed last spring. *Notocactus Haselbergii* is showing about a dozen buds and it also bloomed last spring." She says that she is rather isolated from other cactophiles but always learns a lot from the JOURNAL and its various columns.

—o—

Mrs. D. E. Schultz from El Reno (who, by the way, is one Oklahoma cactophile that I do not have in my directory list yet) writes the Editor a letter which should have made his Christmas a happy one. She writes, "I always liked 'Spine Chats' and 'Cereusly Speaking' but was about to stop taking the JOURNAL because the rest of it was over my head. But this last year, I like it a lot better because of the Color Plates, Johnson's 'Question and Answers,' " and she even mentioned my little new page, "Keeping up with the Spines." She used to live in Iowa and has only been in Oklahoma for one year but already has over a hundred cacti. *Keep them growing, Mrs. Schultz, there are a lot of swell cactophiles in Oklahoma.*

—o—

Hugh Brown of Ontario, Canada, is almost a new cactophile but he must have jumped in with both feet for he now, after only three years, has two hundred and fifty varieties. However, he says he gets confused sometimes by the conflicting advice in the books and writings of the authorities. *Well, Hugh, we all do and I have decided that the safest thing to do is to stick to methods that give me the best results, and only use the books as my general guide and reference. My rule is; good soil, free drainage and a good watering when they really need it, according to their mode of growth. You can't over water a water lily but you can kill even a desert cactus by drought, especially in a pot.*

—o—

Why don't we do something about the gross ignorance that exists about the location of cacti in the various parts of this country? Why doesn't some individual or some group of those mutually interested, make an amateur survey of all the cacti native to their respective states? This could be written up in the form of a travelogue or even a series of trips, covering the entire state. This sort of literature would be very interesting to all of us and, if the unidentified ones that are found, were sent to the Research Committee for identification, we would not only have interesting reading but would be rendering a real service to cactophiles all over the world.

Mr. John R. Kelsey has done it recently for his state, Oregon. I have one in preparation for Oklahoma. Surely there are others who can and should do it for their states, and, have a lot of fun doing it.

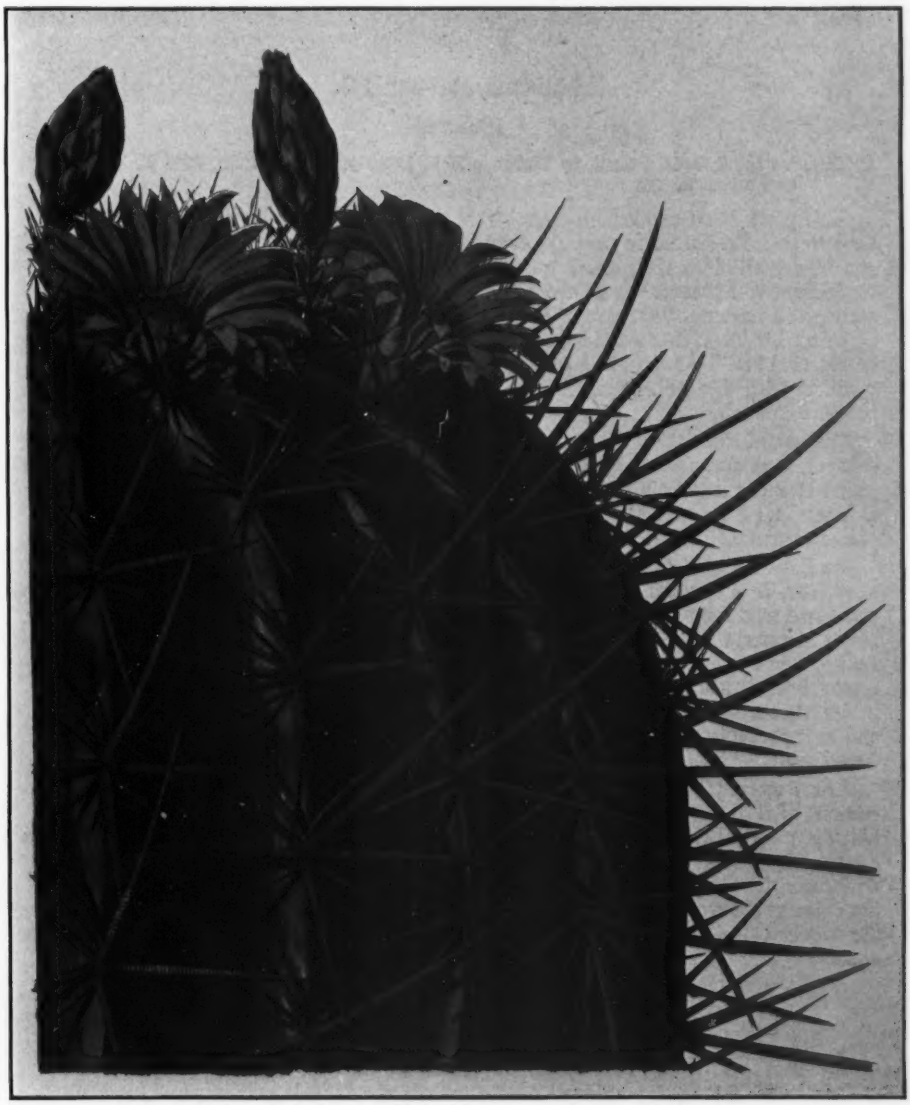
What is the matter with New Mexico? They have a lot of cacti and nice ones, too. They really need a good survey, for the benefit of the State Horticulture Society and those of us who like to collect there. California, Arizona and Colorado have books about theirs.

Who will volunteer? Let me know and I will do all I can to help. G. L. B.

—o—

Almost every day brings an inquiry about when the directory of cactus collections will be ready. I can't answer that question yet. When I started it, I expected to have two or possibly three thousand names in it. Now I find that there will be at least ten thousand and, believe it or not, it takes a little time to find the ten thousand. However, I am planning to have part of it ready late this next spring and may have it printed then, completing it a few pages at a time, as more collections are found and listed. Being a loose-leaf type of book, this can readily be done without disturbing the former listings. If I wait until I have them all before printing, it will take at least another year to complete it.

G. L. BERRY, Lawton, Okla.



Echinocactus ingens Zucc.

PLATE 22

From Blühende Kakteen—March 25, 1902

Echinocactus tabularis Cels

PLATE 23

Echinocactus tabularis Cels, Catal. by Weber in Bois, Dictionn. des horticult., 469; K. Schumann, Gesamtbeschr., 389.

This plant is an excellent illustration of the complete neglect with which botanists have treated the Cactaceae since the time when such men as Prince Salm-Dyck, Pfeiffer and others withdrew their activities from the scene. It was imported by Cels, in whose establishment it bloomed from about 1835 to 1855, and who described it in one of his catalogs—I have not been able to discover in which. Undoubtedly some decades passed by before Dr. A. Weber listed it in the section he compiled on cacti for Bois' "Dictionary of Horticulture." As long as I have been occupied with the Cactaceae I have been acquainted with this striking and beautiful plant whose distinct appearance is due to its brown coloration.

One could associate this species with *Echinocactus concinnus* Monv., either by considering it as a variety or by uniting the two completely. I favor neither opinion, but rather consider it to be a quite distinct and well-separated species. Besides the fact that *E. concinnus* has fewer spines at the crown, the further difference in the color of the plants assures their separation; seedlings are easily told apart.

As *Echinocactus tabularis* blooms copiously and willingly sets seed, nearly all of which germinate, it is very easily increased. In the Royal Botanic Gardens of Berlin we have often had whole pots of seedlings. For this reason we are right in supposing that the plants at present found in collections are direct descendants of the original importation. At any rate I am not aware that either it or *E. concinnus* have been imported again in recent times. Somewhere in the south of Brazil, perhaps near the borders of Uruguay or in the latter country itself, is the now-forgotten locality from which this species originated, and as it probably does not grow alone it is not impossible that other new things will be found there.

I have recently been asked for the meaning of the names which I have chosen for the sections of *Echinocactus*. Unfortunately I forgot to explain these names at the time and will make up for this neglect in the future. The present *Echinocactus* belong to *Notocactus*. "Notos" is one of the Greek words for "south." More correctly the word designates the rainy south-west winds of Greece and is akin to "notia" (moisture). I have chosen the expression *Notocactus* (Southern Cactus) in order to point out that all the species of this group live in the southern part of the distribution area of the Cactaceae.

CLASSIFICATION—1949

Notes by W. TAYLOR MARSHALL

Notocactus tabularis (Cels) Schumann.

Assigned to *Malacocarpus* by Britton and Rose, the species lacks the "soft fruit" indicated by the name but does have a dry capsule densely covered by wool as indicated for *Notocactus*.

Echinocactus tabularis Cels

PLATE 23

From Blühende Kakteen—March 25, 1902

Echinocactus occultus Phil.

PLATE 24

Echinocactus occultus R. A. Philippi, Flora Atacamens., 23; K. Sch., Gesamtbeschreib., 393.

One gathers from the brief treatment of this plant in the "Gesamtbeschreibung" that at the time this book appeared it was still quite insufficiently known. Certainly I am not wrong when I say that it had never been sent to Europe before then, for I find no mention of it in the usually accurate reports in the gardening journals. For detailed knowledge we are obliged to the little known and unappreciated efforts of Söhrens, Director of the Botanical Garden of Santiago, Chile. He collected the plant on his journey to the Cordilleras in the northern part of Chile, and sent a specimen to the Royal Botanical Garden of Berlin; it is a great rarity, found only in a few of the larger cactus collections. To our great joy it bloomed during this last summer.

When one observes the small brownish-yellow growths with their furrowed ribs divided into tubercles with chin-like bases, one well understands why Philippi named it the "hidden" Hedgehog-cactus. In its habitat it is withdrawn into the earth and surrounded by pebbles which have the same color and shape as the tubercles, so that one confuses the two and thus overlooks the plant. Only when blooming is it noticeable.

The spination of the plant is very changeable. I have never seen 6 radial spines, but only up to 4, and these are inserted in the upper end of the linear, to 7 mm. long areole; sometimes the species is completely without spines, though when present they are slightly or entirely bent upwards, black, and rather compressed laterally.

The flower was incorrectly described by Philippi; according to Söhrens he was probably dealing with another species. The petals are certainly not yellow, but as in so many of the Chilean cacti display a characteristic chamois-yellow color and have a reddish dorsal stripe. The interior of the flower is white, with a beautiful silky lustre.

The distribution of the species has been variously reported. The plant does not grow near Copiapo on the coast. Actually this city lies not on the coast but in the interior, 81 km. south-east of its harbor, Calderia. But neither does it grow near Caldera; here the cactus-flora is very poor, even the widely-distributed *Cereus nigripilis* being absent at this spot. After walking from Caldera for 1½ hours through the sand-dunes, one comes to the mountain chains of the Cordilleras where *Cereus coquimbanus* begins to appear. Also growing here are an *Opuntia* and a small *Cephalocactus* with yellow blossoms; the latter were probably confused by Philippi for those of *E. occultus*. Director Söhrens found the plant, blooming in the middle of November, near Breas, 20 km. east of Taltal (thus about 150 km. north of Copiapo), and our illustrated specimen originated from this locality.

CLASSIFICATION—1946

Notes by W. TAYLOR MARSHALL

Neoporteria occultus (Philippi) Br. & R.

SYSTEM OF THE MESEMBRYANTHEMACEAE

By PROF. G. SCHWANTES

Translated by Daniel Neumann, Jr., from "Sukkulentenkunde I"

The following system summary is the revision of an outline for a re-classification of those plants which had formerly been grouped under the genus *Mesembryanthemum* L., and that I set down on June 21, 1941, and sent or lent repeatedly to those interested. (Comp. Botan. Archiv. Vol. 45, 1944, p. 153.)

That the systematic arrangement of these plants has first been possible in our time and that the key to this was first found only a few decades ago, is one of the strangest things in the history of botanical systems. About 100 years ago, Haworth, that distinguished English succulent authority, attempted to resolve the many varied forms into genera. He evidently felt strongly that the differences, some of them very great, existing here must be of generic importance; but over and over again, he writes, he was overcome by various doubts and scruples, with the result that he finally gave up the work, after having isolated only a few groups as separate genera from the mass of those not yet "solved." That Haworth failed lies in the fact that he had not discovered the key—the radically varying fruit structure. N. E. Brown about 100 years after Haworth, working at Kew, was also tremendously impeded when he took up the work again, because he found the key only while he was in the midst of working out his new system. Working together with other authorities, he had split up the old genus into many new ones, but comprehending these genera into a system arranged according to relationship remained still to be done. N. E. Brown also placed many of the genera he had recognized into degrees of relationship which were in part extremely misleading. To mention but one example: He placed the genus *Nelia* Schwant. next to the genus *Dactylopsis* N. E. Br., which in my opinion are not only far separated, but actually belong to different sub-families!

The reciprocal connections of relationship of the new genera and their arrangement into subgroups is therefore extremely difficult, because the lines of development are more in a horizontal than in a vertical direction. In other words, there are numberless cases of similar or identical developments that have absolutely no primary connection with one another; with the result that the convergence can lead to false conclusions. For instance, there are highly succulent forms with marked thickness and growing together of the leaf pairs, and that are in no way related. On the other hand, there are groups of forms which do not deviate from the conventional type of plant with flat leaves, and which could be regarded as the original forms of the succulents, if examination of the fruits and flowers had not proved that they were often very far advanced and specialized structures and obviously quite as far removed from

FIG. 8. *Conophytum Ernianum.* Photo by Krainz.

the root of the development as the highly differentiated succulent forms such as *Lithops, Conophytum, Gibbaeum,* etc. Only within narrow boundaries, i.e. within several subtribes, can developments be seen clearly. Outside the boundaries of the tribe, the closer connections of relationship are only to be discerned with great difficulty, if at all. And yet I believe it to be possible to bring the genera into a system. The following arrangements are an effort in that direction. A detailed consolidation of this system will follow in a special work which is now nearing completion.

The new genera do not correspond in the least in all cases to the sections of the genus *Mesembryanthemum* of the earlier systematisers. Plants were very often placed together in those sections which, as mentioned before, were only connected because of habits, for they really had no connection with one another, and in part belonged to different subtribes, tribes or even subfamilies. Accordingly, even the bare outlines of the earlier systems cannot be recognized in the grouping herewith presented. Hardly a stone remains of the old foundations.

It may be surprising for many readers that the plants treated here appear as a special family,

Mesembryanthemaceae familia nova Herre et Volk in litt. In this, I am following the authorities, H. Herre, of the Botanical Gardens of the University of Stellenbosch, and Prof. O. H. Volk, of the University of Wuerzburg, who in working together on these plants came to the conclusion that they were a group of plants that might better be considered as a separate family, and not as a subfamily or even a tribe of the *Aizoaceae*. I, too, had reached this conclusion many years ago, without proving it further. In a number of contributions dealing with the system of these plants, I treated them as *Mesembryaceae* (see Zeitschrift für Kakteenkunde 1927-28, p. 178, 275, 299); applying a name used by Lindley in 1836, and now used also for many of the genera classed with the Aizoaceae. Because of the objection raised by my friend, K. Dinter, I went back to a sub-grouping of the Aizoaceae. Since, through Messrs. Herre and Volk, I have become convinced that these plants should be separated from the other Aicoaceae, I now adhere to the new family that they have established and set up.

Family **Mesembryanthemaceae** familia nova Herre et Volk in litt.

Subfamily I **RUSCHIOIDEAE**

Funicles receptacular or parietal (excluding Hymenogyne).

Tribe 1 **RUSCHIEAE**

Fruit, a capsule opening upon wetting.

Subtribe 1 **Ruschiinae**

Bushes. Capsule 5-celled with placenta tubercles, valve wings lacking or rudimentary. Compartment covers often with closing edges or cones.

Ruschia Schwant.
Eberlanzia Schwant.
Stōberia Dint. et Schwant.

Subtribe 2 **Bergeranthinae**

Capsules mostly 5-celled with compartment covers and placenta tubercles. Valve wings lacking or rudimentary.

Bergeranthus Schwant.
Acrodon N. E. Br.
Carruanthus Schwant.
Hereroa Schwant.
Rhombophyllum Schwant.
Bylia N. E. Br.
Machairophyllum Schwant.

Subtribe 3 **Leipoldtiinae**

Bushes or stemless. Capsule many-celled with compartment covers and placenta tubercles. Compartment covers often with closing edges.

Leipoldtia N. E. Br.
Cephalophyllum N. E. Br.
Fenestraria N. E. Br.
Cheiridopsis N. E. Br.
Vanheerdia L. Bol.
Marlothistella Schwant.
Cylindrophyllum Schwant.
Calamophyllum Schwant.
Schlechteranthus Schwant.
Odontophorus N. E. Br.
Polymita N. E. Br.
Perissolobus N. E. Br.
Octopoma N. E. Br.

Subtribe 4 **Lampranthinae**

Bushes or stemless. Capsule many-celled with compartment covers and placenta tubercles.

Lampranthus N. E. Br.
Oscularia Schwant.
Ebracteola Schwant.
Echinus L. Bol.
Cerochlamys N. E. Br.
Dicrocaulon N. E. Br.
Astridia Schwant.
Disphyma N. E. Br.

Subtribe 5 **Delospermatinae**

Bushes or small shrubs with hardy rootstock. Capsule without or with rudimentary compartment covers, 5-6 celled.

Delosperma N. E. Br.
Drosanthemum Schwant.
Trichodiadema Schwant.
Peersia L. Bol.

Subtribe 6 **Psammophorinae**

Stempless or bushy! Leaves stuck with sand. Capsule as with Delosperma. 5-7 celled.

Psammophora Schwant.

Subtribe 7 **Erepsiinae**

Bushes or stemless. Capsule without or with placenta tubercles. Flowers with more or less deep tubular calyx stamens partly or wholly included within the tubular cup.

Erepsia N. E. Br.
Semnanthe N. E. Br.
Piquetia N. E. Br.
Argyroderma N. E. Br.

Subtribe 8 **Nananthinae**

Plants of rosette-like or clumpy growth. Leaves commonly papillate. Capsule many-celled without placenta tubercles or with small placenta tubercles.

Nananthus N. E. Br.
Aistocaulon V. Poelln.
Titanopsis Schwant.
Rabiea N. E. Br.
Kaadia N. E. Br.

Subtribe 9 **Pleiospilinae**

Stemless. Leaves marked with numerous dark spots. Capsule cellular with compartment covers and placenta tubercles.

Pleiospilos N. E. Br.

Subtribe 10 **Stomatiinae**

Creeping shrub or stemless. Leaves warted, papillose. Capsule five-celled, without placenta tubercles.

Chasmatophyllum Schwant.
Stomatium Schwant.
Rhinephyllum N. E. Br.
Neorhine Schwant.
Agnirictus Schwant.
Henricia L. Bol.

Subtribe 11 **Neliinae**

Of clumpy growth. Stiff petals. Capsules as with Delosperma.

Nelia Schwant.

Subtribe 12 **Herreanthinae**

Stemless. Leaves short and thick. Capsules as with Delosperma.

Herreanthus Schwant.

Subtribe 13 **Dracophylinae**

Compact low-lying bushes with thick leaves. 2-25 stigmas. Capsules with developed or rudimentary compartment covers, or none at all.

Dracophilus Schwant.
Juttadinteria Schwant.
Namibia Schwant.

Subtribe 14 **Lithopinae**

Leaves of the seedlings grown together as spherical or conical body, later becoming more separated; the original form remaining only in the case of Lithops. Stemless. Capsules as with Delosperma.

Lithops N. E. Br.
Schwantesia Dint.
Lapidaria Schwant.
Dinteranthus Schwant.

Subtribe 15 **Frithinae**

Stemless. Calyx and corolla grown together in tubular form. Capsule five-celled of Delosperma type. Leaves cylindrical, tips fenestrated.

Frithia N. E. Br.

Subtribe 16 **Gibbaeinae**

Stemless. Capsule 6-celled or many-celled, generally wiht compartment covers, without placenta tubercles.

Antegibbaeum Schwant.
Didymaotus N. E. Br.
Gibbaeum N. E. Br.
Imitaria N. E. Br.
Muiria N. E. Br.

Subtribe 17 **Conophytinae**

Leaves grown together into cordate or conical body, stemless. Petals more or less grown together in tubular form.

Oophytum N. E. Br.
Conophytum N. E. Br.
Ophtalmophyllum Dint. et Schwant.
Berrisfordia L. Bol.

Subtribe 18 **Faucariinae**

Stemless, generally with leaves dentated on edge. Capsule of Faucaria type.

Orthopterum L. Bol.
Faucaria Schwant.

Subtribe 19 **Hymenocyclinae**

Bushy or stemless. Capsule many-celled, with compartment covers.

Hymenocyclus Dint. et Schwant.
Glottiphyllum Haw.

Subtribe 20 **Dorotheanthinae**

Annuals with flat more or less cylindrical leaves, 5-celled capsules, partly with, partly without compartment covers.

Dorotheanthus Schwant.
Aethephyllum N. E. Br.
Pherolobus N. E. Br.
Micropterum Schwant.

Subtribe 21 **Mitrophyllinae**

Bushy or stemless. Capsule 5-celled with compartment covers (except Mitrophyllum), without or with only partially developed placenta tubercles.

Mitrophyllum Schwant.
Conophyllum Schwant.
Meyerophytum Schwant.
Monilaria Schwant.
Diplosoma Schwant.

Subtribe 22 **Carpantheinae**

Annuals with flat leaves. Many-celled capsule. Gills of the compartment walls erect; the gills adjoining the seed compartment pressed over it by a waxy connecting arch and forming a sort of cover for this; seeds large, flat. Transition to the next tribe.

Carpanthea N. E. Br.

Tribe 2 **APATESIEAE**

Capsules with seed pockets, i.e. a hollow space lying outside the seed compartments in the capsule tissue, in which 1-2 seeds develop. Gills of the compartment walls erect without compartment covers. Fruit in part schizocarp or the transition to this.

Subtribe 1 **Apatesiinae**

Annuals with flat leaves. Capsule opening after wetting and swelling, thus forming a connection with the preceding tribe, yet already having the characteirstic seed pockets of the next subtribe.

Apatesia N. E. Br.

Subtribe 2 **Conicosiinae**

Annual plants with flat leaves (Skiatophytum) or biennial and perennial shrubs. Capsules flying open when dry; capsule partition walls erect; the fruit of Herrea is already schizocarp, which, however, still forms a few seeds in the seed pockets; the remainder are contained in the seed pockets of the mericarp.

Skiatophytum N. E. Br.
Conicosia N. E. Br.
Herrea Schwant.

Tribe 3 **HYMENOGYNEAE**

Annual plant with flat leaves, schizocarp with axillar placentas, that here (obviously) belong to a special development, without connection to the subfamily *Aptenioideae*.

Hymenogyne Haw.
Thyrasperma N. E. Br.

Tribe 4 **CARPOBROTHEAE**

Creeping bushes. Fruit fleshy, edible, with parietal placentas, many-celled.

Carpobrotus N. E. Br.

Subfamily II **APTENIOIDEAE**

Funicles axillary. Fruit of the Aridaria type, capsules opening by wetting.

Tribe 5 **APTENIEAE**

Petals soft, not stiff.

Subtribe 1 **Apteniinae**

Perennial plants, capsule 4-celled.

Aptenia N. E. Br.
Platythyra N. E. Br.

Subtribe 2 **Hydrodeinae**

Annual or biennial plants with flat to cylindrical leaves. Capsules 5-celled, as the following.

Mesembryanthemum L. amend. L. Bol.
Hydrodea N. E. Br.
Eurystigma L. Bol.
Halenbergia Dint.
Opophytum N. E. Br.
Callistigma Dint. et Schwant.
Synaptophyllum N. E. Br.

Subtribe 3 **Preniinae**

Perennial, stems with shortened internodes, flowering shoots elongated.

Prenia N. E. Br.
Sceletium N. E. Br.

Subtribe 4 **Aridariinae**

Erect or creeping bushes, often with tuberous or turnip-shaped roots.

Aridaria N. E. Br.
Phyllobolus N. E. Br.
Sphalmanthus N. E. Br.

Subtribe 5 **Brownanthinae**

Bushes with deciduous leaves or remaining as prickles.

Amoebophyllum N. E. Br.
Psilocaulon N. E. Br.
Brownanthus Schwant.

Tribe 6 **DACTYLOPSIDEAE**

Dwarf bush or stemless. Leaves mostly alternate with very long sheathes, digitate, highly succulent. Flowers with stiff petals.

Genera of uncertain classification.

The following genera, I could not as yet classify because they are not sufficiently known to me:

Circandra N. E. Br.
Ectotropis N. E. Br.
Depacarpus N. E. Br.
Enarganthe N. E. Br.
Maughania N. E. Br.
Mossia N. E. Br.
Smicrostigma N. E. Br.
Saphesia N. E. Br.
Vanzijlia L. Bol.
Zeuktophyllum N. E. Br.

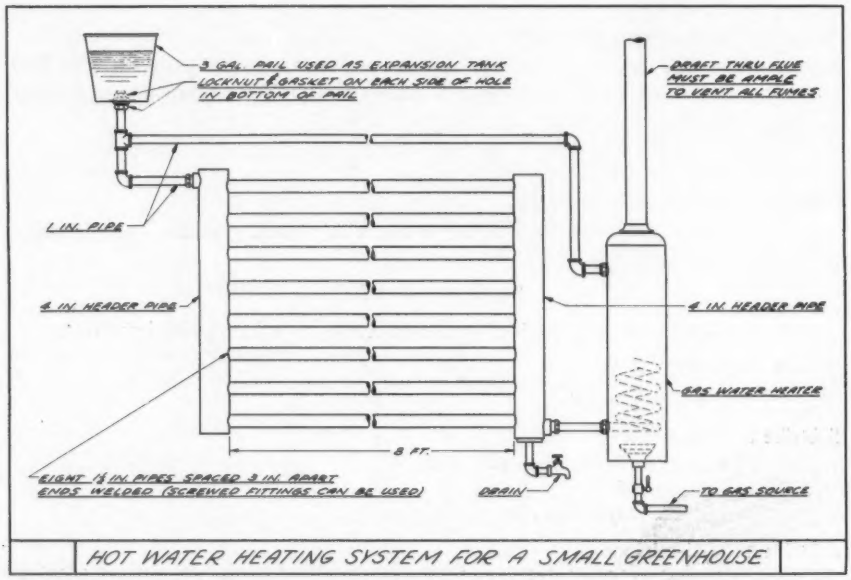


FIG. 9. Percy Harrison of Calgary, Canada, sent in a sketch of his water heating system in his glasshouse. The heating unit runs across the center of the 9x12 glasshouse and maintains sufficient heat with an outside temperature of 35° below zero. We are indebted to Roland G. Aughinbaugh of Beverly Hills, California, for the fine drawing.

CACTUS HUNTING IN OREGON

By an amateur cactophile

Having heard that cacti are to be found in central and eastern Oregon, I couldn't resist the temptation to see, photograph and get specimens for my collection. So my wife and I spent a week's vacation at various points in northeastern and central Oregon, where we found three different varieties of the Opuntia tribe and one that I at first thought was a Coryphantha. A specimen was sent to Mr. W. Taylor Marshall, who identified it as a *Pediocactus Simpsonii* var. *robustior.*

Our first specimens were one of the Opuntias; these were found on the hillsides surrounding Imnaha, in the northeastern part of the state in the Wallowa mountains. They seemed to be a small Platyopuntia, quite spiny and more or less prostrate rather than erect as are most of the "prickely pears." Flowers I was told are red, pink and yellow, blooming the firts part of May. The plants were on an almost barren hillside, xecept for bunchgrass and a few other like plants, among plenty of rocks, and at an elevation of approximately 2000 feet.

A nice specimen of an Opuntia from the territory along the Snake river was presented to us by Mrs. Lee Thompson, when we visited at her home at Halfway. This saved us a side trip to that region as we had heard they were to be found there.

The next specimens were gathered at Baker, where we located them on a hill southeast of the city. They were Opuntias but with shorter and smaller joints, probably a relative of the "jumping cactus" for it was almost impossible to pick them up without some of the joints becoming separated from the main plant and well imbedded in the glove. The soil was mostly a sandy clay with plenty of rocks. Here again sage brush and bunchgrass was about the only other vegetation at this elevation of around 3500 feet.

At Ontario we collected still another Opuntia indigenous to eastern Oregon. These were larger than those found at Imnaha, both in length and thickness of the pads. The blooms were both yellow and red, so Mr. Olin Scarlett told me and it was near his ranch that these were growing. He also mentioned that some of them were frozen during last winter's prolonged cold spell. The elevation there is about 2154 feet.

In north central Oregon, after being directed to what is very appropriately named as "Blizzard Ridge," about twenty-four miles to the north and east of Madras, we dug some three dozen plants of *Pediocactus Simpsonii.* The folks near here call them "button cactus," and many of the smaller ones resemble large buttons on the ground. One of the older specimens collected had reached a height of five inches and a diameter of six inches. Flowers which begin the first of May are white and pink, I was told. This ridge is over 3200 feet in elevation and is quite rocky, consequently the root system of these plants is short, except for an occassional root one foot in length.

With these various plants in separate boxes, labeled as to locality, with pictures at locality, and a notebook with plenty of data, we felt well repaid for our first expedition in search of cacti.

JOHN F. KELSEY

"Sedums"—Two volumes in Swedish by A. Wasberg. 166 pages, 72 illustrations. Postpaid $1.65. Box 101, Pasadena, California.

PRICKLY PEAR JELLY

On a hot July day in 1948, Jim and Mabel Cahill arrived in Phoenix, Arizona, with a view of exploring the possibilities of making this their home. On the trip out from New York City, Jim had prophetically remarked, "We'll probably end up doing something we never dreamed of."

Jim was in advertising; previously, he had been in Wall Street and in the theater. Mabel had been in foods research and foods advertising and publicity. Her experience had been chiefly centered around the development of jam and jelly recipes. She had often thought that surely some new product could be made, not from a new combination of familiar fruits, but from a fruit not used heretofore in jelly-making.

The desert intrigued both Jim and Mabel. While Jim explored the business opportunities, his wife had time to do some exploring on her own.

She had heard of the prickly pear and had even worked with a limited amount of the fruit. Certainly, she thought, there must be prickly pear or other edible fruits on the desert near Phoenix. She picked up the telephone and began calling some of the grocery stores listed. None carried any of the desert fruits.

That aftrenoon she told her husband of her problem in finding out about the edible fruits of the desert. In trying to be helpful he suggested a visit to the Federal Agricultural Department which was near by. During the visit, someone remembered that there was some kind of Cactus Garden in Papago Park.

Soon the Cactus Garden was located in the telephone book. After a few minutes conversation with Mr. Marshall, Director of the Desert Botanical Garden, a visit to the garden was arranged for the following morning.

The visit was most pleasant. Mr. Marshall talked with authority on the possibilities of using desert fruits in a commercial way. Jim's advertising and merchandising experience tempered his lively imagination as to the possibilities of using the desert fruits in food products.

Both prickly pear and saguaro were brought in and tasted. The visit ended with promises of more visits. It was a happy day for the Cahills. They had started a fine friendship with Mr. Marshall and in addition they had hope of producing something new for the American palate.

By early summer a plant was started for the manufacture of desert products. It was a difficult task since there were no precedents. Methods of harvesting and processing had to be worked out. The first venture had to be abandoned. It was a real disappointment after having spent so much time and energy on it. But, encouraged by Mr. Marshall they turned their energies toward another product, Prickly Pear Jelly.

Jim, born and raised in New York City, was unfamiliar with methods of harvesting fruits or any thing else. It fell his lot to harvest the prickly pears. He had a real job on his hands. The spines were all over, they seemed to jump at him. However, he succeeded in working out a method for harvesting the fruit and soon had a crew of men busy.

In spite of the tenacious spines there were some funny moments. Two colored men went with Jim on an exploratory trip. One was picking some of the pears while the other, who had gone only for the ride, was standing nearby. The first fellow turned to his friend and said, "Bill, if I was to fall in this here nest of prickly pear cactus, what's you do?"

Bill pondered a moment, then spoke slowly but surely, "Well," he said, "I'd keep on walking until I come to a doctor." (This in the middle of the desert.) As an after thought he added, "I hope you don't think I'd go in there after you."

Having arrived at a jelly formula and a method of harvesting the fruit, various manufacturing problems occurred. Not only was a new product being made but a new industry was being introduced into Arizona. However, it was not very long before a new aroma, that of the cooking prickly pear startled the neighbors near the plant. The curious wanted to know when Jim harvested the flowers. Time and again he explained that it was the fruit not the flowers that were used in making the jelly. Fruit? Did prickly pear have fruit?

Next came a look at the jelly. What a color! And from that spiny fruit! Then they tasted it. Different, but something like quince, said one, another cherry, another plum, and so forth.

Of course it tasted like prickly pear but none had tasted Prickly Pear Jelly so they picked some favorite jelly their mother or grandmother had made and felt that this new golden-red jelly was something like it—but different. They all agreed that it was different and delightfully pleasant. Therefore, it was natural that the Cahills chose as their slogan, Nature's Gift from the Desert—Delightfully Different.

And so they are doing something they never dreamed of doing—they make Prickly Pear Jelly, something new to delight the palate of the American public.

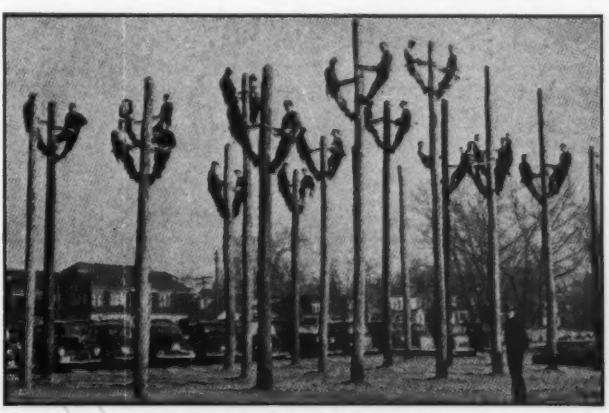


FIG. 10. Cactus Trees? Apprentice linemen at pole top give the appearance of Giant Cacti. From The Narragansett Electric Co.

QUESTIONS and ANSWERS

Conducted by
HARRY JOHNSON
Paramount, Calif.

Question. How do I get the Peanut Cactus (*Chamaecereus Sylvestrii*) to flower? — Mrs. Mabel H. Fay, Mass.

Answer. Under the proper conditions this is a very free bloomer. Its blooming seems to be a matter of proper resting in winter. To flower it in the window garden give it all the light possible in the fall and if you can leave it outside in a dry place till the first light frost do so. Keep it cool during winter. It will stand 10 degrees of frost if not grown too lush in summer. If kept cool the stems turn reddish and become flaccid which is an indication you are succeeding in proper resting. They don't need to be kept too dry if cool enough and if there is a reasonable circulation of air. During the middle of winter they can often be better stored in a cool basement if frost is excluded. Watch out for mice! Plants that are used to cold winters need different resting techniques than plants having warm dry resting periods. Try resting the various semi-hardy Echinocerei as *E. Berlandieri, E. pentalophus, E. Reichenbachii,* etc., the same way. In spring they will straighten up and become turgid when ready for growth. Buds should be apparent then.

Question. To what degree is natural gas, used in cooking and heating, harmful to cacti? I suspect my plants have been retarded.—J. M. Freckleton, Provo, Utah.

Answer. If burners are properly adjusted so that combustion is complete, cacti do not particularly mind it. If fumes are bad enough to injure true cacti they are certainly going to be tough on the family! The particular reason cacti are not so quickly hurt is that during their winter resting period their physiological processes are slowed to a minimum. At no time, of course, are their organic reactions as active as those of normal hydrophytes. Succulents, of a few groups, are another matter. Cotyledons, some Sedums and Echeverias and a few leafy Crassulas are prone to drop the basal leaves when brought inside in the autumn. I have never convinced myself as to whether this is due to carbon monoxide and other by-products of combustion or simply due to temperature or moisture changes. We use open gas flames to heat two large greenhouses with excellent results and grow everything from cacti to succulents in them. We also have hot water heating in another large house. I can see little difference, if any, under either system.

To the second part of your query I should answer that in the fall the plants should be going dormant. It is poor practice to keep them growing in the winter when sunlight is at a premium. Even though one may not lose them the growth made is often thin or etiolated and the plant shortly loses its beauty. In cacti the spinal characteristics of a species do not develop properly unless sunlight is ample. They seldom blossom satisfactorily if kept growing.

Question. I have some Mammillarias showing buds, November 10th. What condition should I maintain?—Jonathan Curtis, Ill.

Answer. Many Mammillarias flower in fall and winter. Give your plants a light situation in the window with as good a circulation of air as possible. Don't put them in cold drafts. Temperatures should not be high or the air too dessicated. A night temperature of 50 degrees should be ample. Probably lower temperatures would prove no detriment. I have many species in bloom outdoors now (December 15) and we have had as low as 26 degrees. *Mammillaria elegans, M. dealtata, M. Werdermanniana, M. Hahniana, M. pyrrohcephala, M. Kunthii, M. Karwinskiana, M. confusa,* and several others are in full bloom. They are flowering unprotected from rain or frosts. However, I think most of these would be injured or perhaps killed if temperatures dropped to 20° or thereabouts. They are in no sense "winter hardy" within the meaning of the term as used in the central or eastern states.

Question. My Lithops have flowered this fall. What care do they need now?—Mrs. Louella Sturgis, Indiana.

Answer. After flowering, Lithops continue growing slowly until the new pair of leaves have absorbed the old pair. They do not need much water from now on. Keep in a light, airy place. If much water is given they will either split open or the old leaves will be so turgid they will be ripped from the plant as the new pair emerge. The new pair must absorb the old pair. Then you will have perfect specimens and no losses.

Recently I received, through the mails, Mulford B. Foster's Catalogue No. 3. "Bromeliads which helped me decide to write about some of the Bromeliaceae I own—Dyckias, Hechtias, Bromelias and Billbergias. Not succulents—you're right, not all of them but exciting if used for accents.

"The Bromeliads are probably best known by the many bizarre plants, often with gorgeously colored flowers which are seen in the hothouses of Botanic Gardens"—from *Succulents for the Amateur*. "There is something utterly fascinating about Bromeliads, but few people in this country are familiar with this decorative group of plants which has so few competitors. They can be an outstanding adornment to the home or warm climate garden. In Europe for nearly a century Bromeliads have been and still are classed among the finest and most desirable decorative plants"—*Catalogue No. 3 of Melford B. Foster.*

The Bromeliads that grow in dry places have developed open rosettes of tough leathery leaves edged with sharp hooked teeth which makes them poor provender even to the proverbial-goat-of-tin-can-eating myth. To this classification belong *Dyckia sulphurea* and *D. rariflora. Dyckia sulphurea* is common in most collections. It is bright glossy green above and striped yellowish green lengthwise beneath, with hooked teeth along the edges of the overlapping rosette of leaves. *D. rariflora* has narrow leaves with slightly hooked brown-black set about ⅛ inch apart along the edges. The leaves are not as glossy as *D. sulphurea* but they have the under-leaf yellow lines. *Hechtia texensis* is a robust Bromediad with greenish-yellow leaves edged with red to purple teeth which are really vicious. The Billbergia and Bromelia I own are interesting long leaved plants with dark green leaves (*Billbergia Nutans*) and striped while overcast with pinkish bloom (*Bromelia Balausae*) with hooked-spiny edges.

Since the Bromeliaceae "Succulents" are just being brought to the Cactophile by the collectors of the tropical regions it is evident that this article can only list a few of those that are now available. Foster lists *Dyckia Fosteriana* with "pinked" edges, *Dyckia Leptostachya* with bronze leaves and a hybrid, *Dyckia Cutak* (*D. sulphurea* X *D. Leptostachya*). There are other Hechtias than *H. texensis* but I've not found them listed in any of my catalogues, etc. "Succulent" Billbergias are almost non-existent as such.

The local names are "Pineapple Cactus," "Tiger Teeth Cactus" (also used for *Faucaria tigriana*) for the Dyckias and "Texas Pineapple" for *H. texensis*. One good woman uses "Texas Hatchet" which I found she had gotten "from a friend of a friend," etc. Evidently it was her interpretation of the Texas Hetchia.

Billbergia Nutans blooms for me during the Christmas holidays and on into January and February. Obliging isn't it. I keep it dry (one watering a week until buds appear). The lettuce green edged, blue flowers dropping from a flamingo-pink-sheath is arresting to the uninitiated and exotic to others. I have seen the "Heart of Flame" (*Bromelia Balausae*—formerly *B. serra*) in bloom. White "club shape" resting in scarlet leaves. Mine is an offset from this one. *Dyckia sulphurea* with its foot to twenty inch stalk or stalks of yellow blooms are "stiff" looking as a plant but still decorative. *D. rariflora* has foot to eighteen inch stalks of orange flowers (for me at least). *Hetchia texensis* has never bloomed although books claim the blooms are white on stalks (no length given). I give it the same soil and care as the Dyckias but it still sulks.

So far I have not listed one disease (that I recognize as such) that attacks any of this month's listings. Foster lists brown and white scale due to poor growing conditions which he says can be eradicated "with finger nail or tooth brush" and give better light by rotating at intervals. He recommends non-oil sprays for Bromeliads. I usually spray all of my collection of plants with "Black Leaf 40" once every two to three weeks just in case. Old plants die back in from one to three years after blooming.

Dyckias are of South American origin and grow in semi-arid regions which accounts for their leathery, barbed leaves. I'm a genuine respector of the Dyckias and Texas Hechtia after years of dealing with them. They are able to give and take. Billbergias are usually listed from Brazil. They like liberal watering with well drained sandy leafmold soils and limited sunlight.

Foster's recommendations seem excellent so I'll quote his—"Among the other types of Bromeliads, species of Dyckias, Hetchias, Ananas, Orthophytum, Neoglaziovia, etc., are interesting spiny succulents either tetrrestial or saxicolous (inhabiting or growing among rocks), all having similar plant form (with many variations) to the pineapple plant. In cultivation they require medium sandy soil with small amounts of dairy manure; they feed directly through their roots although their basal part of the leaves absorb certain foods from the air. Moderate watering suffices their thirst . . . " I've used this method and have never lost one of my small collection which also includes Cryptanthus.

Dyckias are ideal window garden subjects even for the narrowest of spaces if they're given good soil, limited water and plenty of light. *Hechtia texensis* is often two feet across which with its defense makes it only suitable for space. I've hung it from a curtain rod or bird hanger out of the way of me and mine and curtains. The Billbergias and Bromelias are grown both in the greenhouse and in the window garden. If dry leaves appear at the bottom clip them off but if they appear in the center of newer growths give them more water. The blooms of all are attractive but of small to medium size.

The Plant of the Month is *Dyckia sulphurea* which in spite of dryness, wetness, ants in the pot, bruises from falling off shelves, and other specialized misfortunes my plants are heir to, this plant never seems to stop growing, blooming and offsetting freely for me. The plant (offset) will fill a large ornamental type of window container in a few months time if given rich, sandy leaf mold or well rotted manure soils. By the time the parent plant blooms it has several offsets. It stands periods of prosperity as well as periods of adversity (190° hot water to kill ants in pot—plant only slightly brown at edges). I use *Billbergia Nutans* in my winter garden for its exotic coloring and foliage but I use *Dyckia sulphurea* for its sturdy compact lush-green growth and its adaptability to its surroundings—a real cosmopolite.

And thus begins the year 1950.

JOHN E. C. RODGERS
1229-8th Street, Lorain, Ohio.

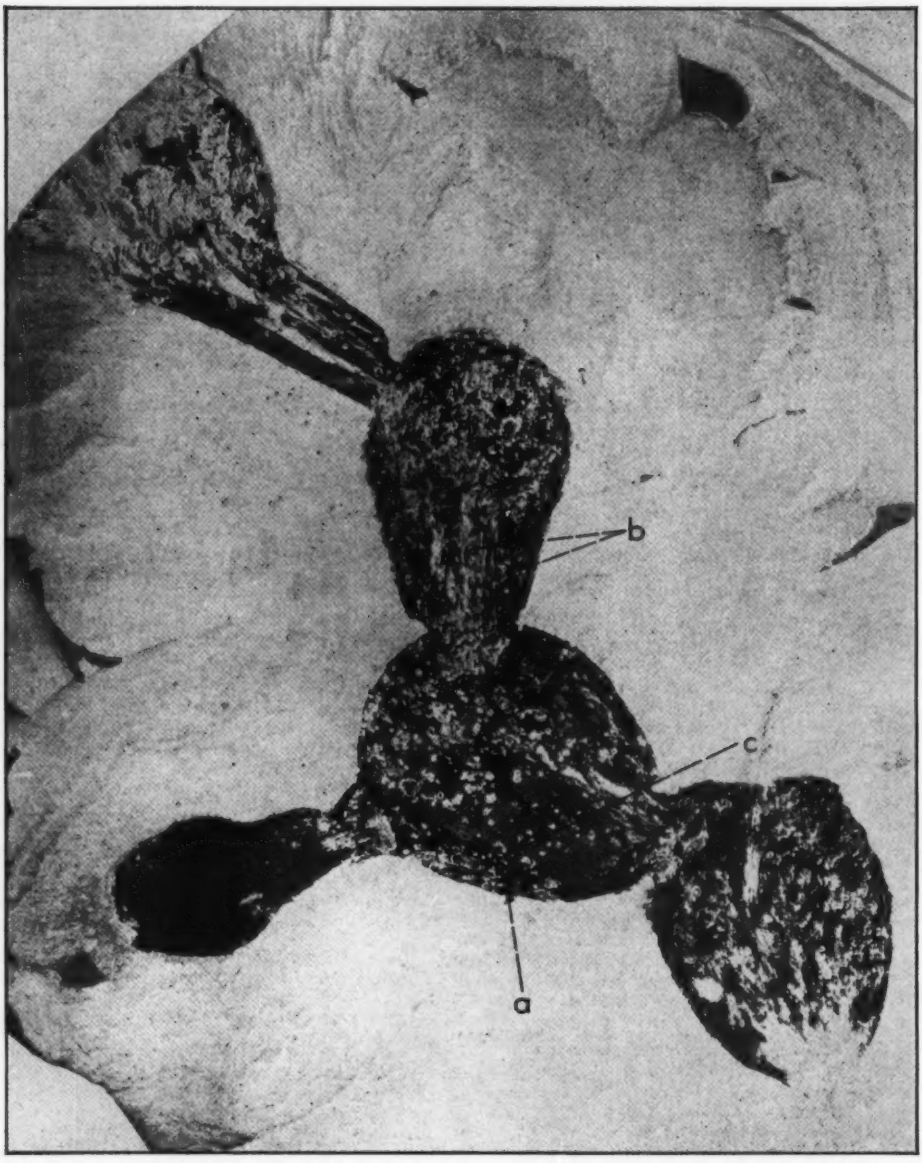


FIG. 11. Type specimen of *Eopuntia Douglassii* x ¾. a, spine; b, areoles; c, impression of vascular tissue.

THE DAWN CACTUS

By SCOTT E. HASELTON

Photos from *American Journal of Botany,* Vol. 31, No. 8. Oct., 1944

In the preface to Colorado Cacti, which was published as a supplement to the JOURNAL in 1940, Dr. Boissevain mentioned the discovery of fossils, thought to be that of cacti, in the shales of the Uinta Basin of Utah by Mr. Earl Douglass.

These fossils were sent to Prof. Ralph W. Chaney of the Department of Paleontology of

the University of California at Berkeley who has published his conclusions in a paper in the October, 1944, *American Journal of Botany.*

He concludes that the fossils are of a species of cactus related to, but differing from, the Opuntias and proposes for them the generic name *Eopuntia,* the Dawn Cactus, and the specific name *Douglassii* to honor their discoverer.

Eopuntia Douglassii is described as a cactus with succulent, flattened joints which were less spiny that the present Opuntias, and the fruiting bodies globose with a narrowed to elongate, stem-like base. The stems were 6 to 7.3 cm. long and 2.5 to 5.5 cm. broad while the fruiting bodies reached a total estimated length of 6 to 8.5 cm.

One of the fossils showed the details of the stem structure and vascular structure and two of the fossils showed the outer surface which was apparently about the same thickness as those of present Opuntias.

Professor Chaney's conclusions from the evidence at hand would indicate that the Cactaceae were represented on the American continent 35 to 60 million years ago and would require a complete readjustment of the opinion generally accepted till now that the family was of comparatively recent origin.

I saw the original photos with heavily opaqued background which gave the fossil its form. I have talked and corresponded with many about it. The general form and configuration of the specimen certainly suggests an Opuntia very strongly. But it might have been an alga or most anything else. I was impressed with the appearance and general design of the vascular tissue, which bears almost no resem-

FIG. 12. Terminal flower of type specimen x 1.5. a, reflexed petals; b, detached petals?; c, areoles; d, impressions of vascular tissue.

Many JOURNAL readers have asked for an explanation of the areoles in the petals (c) of the flower, and why the flower is more of the Cereus form than of an Opuntia.

blance to that of the living Opuntias. And if there is anything that is conservative about the characters of age-long plant stocks it is just that feature.

I have always thought of the Opuntia group as being perhaps old in the southern part of its range but relatively recent north of the International Boundary. The present distribution of the various species and what the phytogeographers call their "filiation" and "speciation" certainly strongly suggest a northward movement that has taken place since the Pliocene. Of course, there may have been earlier development in the group in the northern part of their range, and there may then have been a recession followed by a later advance. It is anybody's guess. Maybe some day we will be fortunate enough to have more material from additional localities.

FIG. 13. This formation resembles a petrified cluster of *Mammillaria herrerae* and was found in the same locality by F. Schmoll, Mexico. Photo by Otto Nagel.

Dear Editor:

After reading Curt Backeberg's article in the July-August JOURNAL, the question has arisen in my mind, how much weight must be given to mere flower form in the determination of genera? Possibly some of your readers can tell me.

In my Lower California Botanical Garden are several specimens of Fouquierias, commonly known to your south-western readers as "Ocotillo." One species or perhaps two have long tubed, scarlet flowers that never open. The pistil and stamens are simply exserted beyond the tips of the petals. Another long tubed scarlet flowered species has petals that recurve to form a perfect roll around the tube. A new white flowered species bears a medium tube with petals that reflex to form a right angle with the tube. Still another new species has a short tube flaring into a campanulate type of flower with thick pink petals that look as though they were made out of wax.

I have the impression after reading Backeberg's article that these cannot all be Fouquierias. There must be at least four genera represented in my collection. Yet I do not believe there is a botanist in the country that can tell them apart by examining cut branches bearing spines and leaves.

Backeberg makes reference to support his claims as he has frequently done in other publications, to the so-called fossil Eopuntia. No one has ever explained why this formation, which appears to be the impression of an Opuntia pad, bears a flower impression of the Cereus type. Possibly the flower went off on its own tangent to form the Cereus group and the pad went its own way developing a different type of inflorescence.

HOWARD E. GATES.

SPINE CHATS

LADISLAUS CUTAK

All eyes are focused on Colorado—that is, cactus eyes! That's where the next convention will be held in 1951. The event may still be far off but give it some thought now. Colorado is a wonderful state in more ways than one. To the cactus fan it offers about twenty-five species scattered throughout its domain. Those of you who plan to attend the next convention will get a chance to see a few around the Denver area. Provided you have a few extra days you can plan on cactus hunts in other sections, too. Now is the time to get out your copy of Boissevain & Davidson "Colorado Cacti" and study the localities where these plants grow.

Around Brighton, which is less than twenty-five miles north of Denver, one is apt to come across the green-flowered hedgehog, *Echinocereus viridiflorus*. As you may know, this little cactus enjoys a wide distribution and therefore will exhibit variations in size, number of spines, and coloration. A few years ago, Mrs. A. T. Allen collected several small hedgehogs from near Brighton and despatched them to me for trial in our experimental hardy rockery. The plants lived and flowered for several years but finally succumbed when an unusually wet season arrived. I thought it might be worthwhile to describe this Echinocereus from the Brighton district.

All the *Echinocereus viridiflorus* from Brighton happened to be single-stemmed but an occasional specimen exhibited two heads. The stems were more or less globose-cylindric, averaging two to three inches in height. The low, slightly-tubercled and more or less spiralling ribs, eleven to fourteen in number, bore circular rather than elongated areoles, which at first were filled with white wool but later became nearly naked. Most of the spines were variegated and two centrals were always present. The radial spines numbered eleven, but in addition there were two to six much smaller ones confined to the upper end of the areoles. The slender, radiating radials were highly colored and longest in the lower half of the areole. In some areoles all the radials were red, in others white with red tips, or the upper ones were all white and the rest red and vice versa. Because of the bands of light and dark about the plant caused by the highly colored spiny armament, *Echinocereus viridiflorus* can be put in the "rainbow class." The central spines were always two to an areole, perpendicular in arrangement, the lower was always white with brownish or reddish tip, slightly curving and 2 cm. long.

The green flowers arose from the middle or lower than the middle of each stem and were fragrant with a pleasing lemon scent. When fully extended the blossoms measured 1-1½ inches long and 1 inch wide. The perianth segments (sepals and petals) were of a shining green color, somewhat linear-lanceolate, obtuse. A wide dark brown stripe appeared on the outside of the sepals, more pronounced in the upper portion from the middle to the tips. White bristles, about 10 in number, were noticed in the areoles on flower tube and ovary. Filaments were white with pale yellow anthers. The pistil, about 2 cm. long, was white and subtended by 6 or 7 greenish stigma lobes. The blooming period occurred during the early part of May.

* * *

Mr. V. L. Cory, field botanist of the Southern Methodist University Herbarium, writes on the disappearance of plant species from the range in Texas in *Field and Laboratory* (17:99-115, June 1949). He began studying the range in 1923 and has found out that under conditions of continuous grazing certain palatable species of range plants have disappeared, while others have been severely reduced in abundance. Some thirty species of native plants, including four Ephedras and two Nolinas, formerly common have now nearly or completely vanished. Nolinas and Ephedras are often included in xeric collections and therefore merit a note here. Ephedras are slender-stemmed bushes with leaves reduced to scales and in appearance unlike any other plants on the range. Where goats are grazed, these spreading bushes soon make their disappearance. *Ephedra antisyphilitica, E. aspera, E. Coryi* and *E. pendunculata* are browsed at times almost to the ground and this causes their disappearance from the range. *Nolina Lindheimeriana* and particularly *N. texana* are also disappearing from the ranges. The budding inflorescence shoots of the latter are choice items of feed for range livestock and therefore are relentlessly sought out and eaten, so that none get to bloom, to say nothing of producing seed. Hence there is no reproduction of the species on the range. Further, the cattle are especially fond of the succulent short branches of the caudex and when done excessively kills the plants.

* * *

All of you folks, who have attended any of the cactus conventions in St. Louis, Cincinnati, and Phoenix, and who have taken good pictures of the proceedings, are asked to write me and help arrange a program for the next convention. Howard Gates and I are planning a reminiscence hour in Denver and would like to secure pictures or negatives of the various activities, as well as unposed candid shots of the members in attendance. If you have any pictures or slides which could be duplicated, please contact me as soon as you can. Send me the pictures, slides or negatives and I'll select the ones best fitted for the program. Your originals will be mailed back to you as promptly as possible and unharmed. I need your cooperation to put this program over, so won't you write please?

* * *

Euphorbia antisyphillitica is an interesting desert shrub with tuber-like roots that shoot up hundreds of leafless, pale green stems that are somewhat smaller than a lead pencil in diameter. The plant is of commercial importance because of the wax which accumulates on the stems in the form of white powder. The plant also contains a good fibre which may be utilized in the manufacture of a high grade of paper.

AN OPEN LETTER TO CACTUS DEALERS

Dear Cactus Dealers:

In a recent letter to the editor of the Cactus and Succulent Journal of America I commended him on the magazine that fills the needs of the advanced student and collectors. It is of the equivalent of a college education in cactus lore. But who is going to provide the elementary education? Upper education could not survive without the primary schools.

I understand that millions of cacti and the other succulent plants are shipped each year to retailers all over the United States and Canada with sufficient remuneration so that most of the legitimate growers are still in business. What are you doing, Mr. Dealer, to educate those who buy your plants so that they know how to care for them? My guess is that the mortality of plants, if it were known, would be astounding. If your plants are worth selling, are they not worth being kept alive?

Why not tell your public if they are the same as cut flowers—short lived and to be replaced after they lose their beauty? Or with proper treatment can they be expected to grow and even flower? Tell them to enjoy the plants for their own beauty and not expect them to flower as well as they might on the desert or in their varied habitats. Honest publicity will prevent disgruntled buyers and proper cultural directions will encourage additional purchases in proportion to their success in growing these plants. Use common names along with their scientific names and don't forget the value of pictures.

Outside of your growers' group I think that Hummel's Exotic Garden has contributed the kind of material that amateurs are looking for. I refer to their *Victory Picture Book*. Your own Harry Johnson has for years distributed perhaps millions of catalogs that have been the only source of information for those who buy their first plants. Could not the Association undertake part of this educational responsibility with printed literature and popular articles in all of the larger magazines? Counteract the misleading articles that cacti can be grown anywhere and without care and that they flower the year around. Educate the public so they will recognize "junk" plants dumped on the market by the unscrupulous propagators; we understand that this is one of your Association aims—to encourage shipping "good" plants.

In closing, may I enquire why there hasn't been a single advertisement in the Journal from one of your Association members the whole of last year? Are there no retailers who can supply amateurs with plants of various sorts to round out their collections? I believe that much can be done to keep alive the interest in these plants. Unless action is forthcoming this enthusiasm will just become another short-lived fad.

A. C. STADELMAN, Canada.

NEW REPRINTS AVAILABLE

"What Kinda Cactus Izzat" is now available in its sixth reprinting. Reg Manning's book shows in cartoons a "who's who" of strange plants of the southwest American deserts. True botanical facts are presented with a chuckle on every page. If you do not possess this book be sure to add it to your library or give one to a friend so that he may better understand your weakness and interest in cacti. Postpaid in U.S.A. $1.85, foreign $2.00.

"Cactus and Other Succulent Plants' by H. M. Roan, has been reprinted and is now available bound in light board covers. This well illustrated 72 page book is written for the amateur and introduces one to many of the cacti and other succulents with advice on propagation and culture. Living room culture is explained thoroughly and a "month by month advice" concludes this excellent book. Postpaid $1.65.

"The Enigma of the Origin of Monstrosity and Cristation in Succulent Plants" by J. J. Verbeek Wolthuys is now available as reprinted in Holland. The 112 page book is printed in two languages—Dutch on one page and English on the opposite page. There are 27 illustrations. The final word on the causes of monstrose and cristate plants has not been written but this book discusses the many and varied theories. Postpaid $1.00.

BARGAINS

"Het Cactusboek" by J. J. Verbeek Wolthuys was published in the Dutch language, 1928. The 170 pages comprise the classification of cacti according to Britton and Rose. There are 113 well printed pictures, taken from "The Cactaceae." Fortunately the names of the plants are the same in English so that the classification can be followed. We have sold this book for $3.50 but can now offer it for 65 cents postpaid.

"Vademecum bij het Verzamelen en Kweeken van Cactussen en Overige Vetplanten" by Chr. De Ringh. This Dutch book contains 50 illustrations but we do not know what it is all about! There is an extensive list of specific names with their meanings in Dutch. As long as they last we will send a copy for 25c with each order of "Het Cactusboek."

ARIZONA HIGHWAYS—DECEMBER 1949

The color reproduction in this Christmas issue is without doubt the finest rendition of desert and cactus pictures we have ever seen. Of course, with the fine Proctor photographs we should expect exceptional results. The cover picture of a Christmas candle and red berries is a masterpiece that will never be duplicated; Mrs. Proctor supplied the Kodachrome. Of the 44 pages in color, 24 are of cacti and their homes—you will want two copies in order to frame them all! The other color pictures are desert trails, scenes, and Indian dwellings. We have purchased a few extra copies which we will wrap well for mailing and send postpaid for $1.00.

ABBEY GARDEN PRESS
Box 101 — Pasadena 16 — California
Please add Sales Tax on California sales

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FROM MEXICO

You are loving nature, if you love Cacti. Then ask for my new enlarged Cacti Price List which contains many novelties.

FRITZ SCHWARTZ
Apartado 347 San Luis Potosi, SLP Mexico